Financial digitalisation driving 3D printing utilisation and enhancing operational performance in the Indian textile industry

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ABSTRACT – REZUMAT

Financial digitalisation driving 3D printing utilisation and enhancing operational performance in the Indian textile industry

India's textile sector is undergoing a significant shift as digital banking systems begin to reshape the way firms access capital, manage payments, and coordinate operations. As manufacturers increasingly use 3D printing for customised production and rapid prototyping, seamless digital financial services are now essential to sustaining efficient, well-coordinated supply chain operations. This study shows that rather than being merely auxiliary tools, advancements in digital banking actively accelerate the adoption of 3D printing technologies and improve operational responsiveness in textile companies. Despite these advancements, industry-wide growth still faces challenges like disjointed digital payment infrastructures, low user familiarity with banking technologies and credit disbursement delays. In order to overcome these limitations, the study presents an integrated Digital Banking–Enabled 3D Printing Supply Chain Model that shows how digital finance improves information flow, fortifies vendor relationships, streamlines procurement processes and facilitates design-to-production cycles. Empirical insights from a diverse group of 580 customers, 90 credit employees, and 35 digital banking administrators enabled a thorough assessment of mobility-based banking behaviour, loan dependence, transaction intensity, supply chain agility, and the degree of 3D printing utilisation. Partial least squares path modelling (PLS-PM) was used to examine seven theoretical pathways that relate digital banking capabilities to technological adoption, production adaptability, financial stability, and overall supply chain outcomes. The results are meant to assist financial institutions, regulators and leaders in the textile sector in developing a technologically advanced and creative manufacturing environment.

Keywords: *3D printing, digital banking, FinTech ecosystem, textile supply chain, PLS-SEM, digital credit access*

Digitalizarea financiară stimulent pentru utilizarea imprimării 3D și pentru îmbunătățirea performanței operaționale în industria textilă din India

Sectorul textil din India trece printr-o schimbare semnificativă, pe măsură ce sistemele bancare digitale încep să remodeleze modul în care firmele accesează capitalul, gestionează plățile și își coordonează operațiunile. Având în vedere că producătorii utilizează din ce în ce mai mult imprimarea 3D pentru producția personalizată și prototiparea rapidă, serviciile financiare digitale integrate sunt acum esențiale pentru susținerea unor operațiuni eficiente și bine coordonate în cadrul lanțului de aprovizionare. Acest studiu arată că, mai degrabă decât să fie simple instrumente auxiliare, progresele din domeniul bancar digital accelerează în mod activ adoptarea tehnologiilor de imprimare 3D și îmbunătățesc capacitatea de reacție operațională a companiilor din sectorul textil. În ciuda acestor progrese, creșterea la nivel de industrie se confruntă în continuare cu provocări precum infrastructurile de plăți digitale fragmentate, familiarizarea redusă a utilizatorilor cu tehnologiile bancare și întârzierile în acordarea creditelor. Pentru a depăși aceste limitări, studiul prezintă un model integrat de lanț de aprovizionare bazat pe imprimarea 3D și susținut de serviciile bancare digitale, care arată cum finanțele digitale îmbunătățesc fluxul de informații, consolidează relațiile cu furnizorii, eficientizează procesele de achiziții și facilitează ciclurile de la proiectare la producție. Colectarea de informații empirice de la un grup divers format din 580 de clienți, 90 de angajați din domeniul creditelor și 35 de administratori din domeniul bancar digital a permis o evaluare aprofundată a comportamentului bancar bazată pe mobilitate, pe dependența de împrumuturi, pe intensitatea tranzacțiilor, pe agilitatea în cadrul lanțurilor de aprovizionare și pe gradul de utilizare a imprimării 3D. S-a utilizat modelarea căilor prin metoda celor mai mici pătrate parțiale (PLS-PM) pentru a analiza șapte căi teoretice care leagă capacitățile bancare digitale de adoptarea tehnologică, adaptabilitatea producției, stabilitatea financiară și rezultatele generale ale lanțului de aprovizionare. Rezultatele au rolul de a sprijini instituțiile financiare, autoritățile de reglementare și liderii din sectorul textil în dezvoltarea unui mediu de producție creativ și avansat din punct de vedere tehnologic.

Cuvinte-cheie: *imprimarea 3D, serviciile bancare digitale, ecosistemul FinTech, lanțul de aprovizionare din industria textilă, PLS-SEM, accesul digital la credite*

INTRODUCTION

Additive manufacturing, sometimes referred to as three-dimensional printing (3DP), improves sustainability and cost-effectiveness while providing benefits in product design, especially in a variety of industries like the automotive and medical sectors. Rapid prototyping and design are made possible by this technology, which also allows for the customisation of

apparel and fashion accessories according to specific body shapes. Wearable smart textiles that track performance and health are examples of recent developments that show the potential for connecting clothing with physical condition monitoring. With an emphasis on sustainability, 3DP in fashion seeks to lower waste production and expenses, as demonstrated by successful initiatives to produce eco-friendly fashion jewellery. The innovation and potential of 3DP technology in the textile and fashion industries are highlighted in this paper with a focus on sustainability and design complexity. Small textile weavers in developing nations like India have been reluctant to use digital banking techniques. This is because traditional payment methods are preferred and digital payment systems are not well-known or trusted. Furthermore, many small textile weavers don't have the internet or smartphones needed to use digital banking. Due to these difficulties, small textile weavers are unable to fully engage in India's expanding digital economy [1].

In addition to highlighting the numerous real-world issues that contribute to Indian textile weavers' reluctance to use digital banking, this study uses the stepwise regression method to develop an appropriate model that could illustrate the important factors that contribute to small textile weavers' reluctance to use digital banking [2]. FinTech's potential is acknowledged, but its adoption is slow, and entrepreneurs complain about bank services and look for other sources of funding. For the microtextile industry, fintech is thought to be the most promising source of funding. This study closes a gap by concentrating on Punjab, India's FinTech scene, where there is a clear need for these kinds of solutions [3]. With funding from Bank Indonesia, this study investigates the obstacles that 128 SMEs in the textile industry face when attempting to adopt digital technology. The study, which focuses on batik weaving and clothing production, evaluates obstacles found in the literature using content validation techniques [4].

In light of the digital economy's transformation, the article addresses strategies for the sensible use of production capacity to improve financial security in textile businesses. It uses the Augmented Dickey-Fuller test for statistical analysis and forecast scenario creation to examine Uzbekistan's textile exports from 2010 to 2020 [5]. Forecasts for Tashkent's textile industry indicators from 2022 to 2026 are also provided along with both fixed effects and random effects panel regression models. The presentation concludes with suggestions for enhancing financial security. E-wallet adoption is still low in rural Pakistani cities despite the growing popularity of digital payment methods [6].

Additionally, Ease of Use (EOU) has a positive effect on BI, and Digital Financial Literacy (DFL) greatly improves PU, which increases customer trust [7]. A future dominated by digital printing, which offers cost and time savings and fosters creativity and competitive advantages for businesses, is promised by advancements in high-speed machines and nano inks [8]. The textile and apparel industries have been forced to adopt smart technologies (ST) in the context of Industry 4.0 and a circular economy (CE) as a result of the growth of globalisation and digitisation. Through a thorough review of the literature and surveys of industry experts, this study identifies eleven major obstacles to the adoption of CE-ST in the Indian textile and apparel sectors [9].

In order to help practitioners, stakeholders, legislators and business executives successfully implement CE-ST practices, this research is groundbreaking in its identification, analysis and mitigation of these barriers. To improve transparency, fashion companies are digitising their supply chains [10]. However, a lack of a digital mindset, software maturity and cost have all prevented full implementation. This transformation requires significant adjustments to organisational culture and systems management. End-user system resistance is a prevalent problem [11]. To increase the acceptability of digital banking services in India, unorganised sector workers must participate in training programs. It seeks to promote innovative activity among textile enterprises and compares textile production indicators among Eurasian Economic Union (EAEU) members. Transitioning to competitive product manufacturing using domestic raw materials, boosting export-oriented production, modernising equipment through foreign investment and filling specialist shortages by hiring foreign experts are some suggested ways to improve [12]. According to the study, while digitisation improves transaction visibility, SME executives can use SCF to maximise working capital and reduce risks. This study closes a gap in the literature by demonstrating the moderating effect of trade digitisation and empirically connecting SCF to firm performance [13].

The importance of human resource (HR) accounting and disclosure for organisational success is examined in this research paper with a focus on the textile sector in Serbia, a developing nation. Although HR data is usually included in annual reports in developed countries, this practice is relatively new in the Western Balkans [14]. The knowledge of data-driven sustainable supply chain management (SSCM) indicators linked to ambidexterity and industrial disruption is expanded by this study. SSCM encourages cooperation between supply chain participants while emphasising environmental, social, and economic aspects [15]. The creation of indicators, hierarchical structuring, and the identification of important textile performance indicators were all lacking in prior research. Using the fuzzy Delphi method for validation in the textile industry, this study uses a hybrid approach to extract indicators from databases and existing literature. Financial vulnerability, supply chain uncertainty, risk assessment and resilience are among the critical elements that the analysis highlights as being essential for successful SSCM during disruptions [16].

RESEARCH METHODOLOGY

The study's methodology methodically assesses how digital banking can help the Indian textile industry adopt 3D printing and improve supply chains. It adopts a quantitative framework with one qualitative component, integrating measurement constructs, sampling techniques, data collection and a strong analytical model. In line with developing a Digital Banking–Driven 3D Printing Supply Chain Framework for industry practitioners and policymakers, this approach seeks to fully comprehend how digital banking propels technological transformation in textile production.

Data collection

A cross-sectional survey was used to gather data from stakeholders in the textile industry, such as bank clients, credit officers and digital banking managers with expertise in fintech and mobile banking, as shown in table 1. Online and in-person questionnaires were used to gather primary data from five Indian textile clusters: Tiruppur, Surat, Ichalkaranji, Ludhiana, and Erode. Responses to the questionnaire were scored on a five-point Likert scale and included constructs such as supply chain agility, production flexibility, digital banking adoption, digital credit availability and 3D printing usage.

Data tools used

The primary data tool employed was a structured questionnaire developed based on prior digital banking, fintech, and technological adoption literature. The instrument was validated through expert review and pilot testing with 30 respondents. SmartPLS 4.0, which was selected for its capacity to manage intricate models with numerous latent variables, was used to statistically carry out partial least squares path modelling (PLS-PM). Average Variance Extracted (AVE) was used to evaluate convergent validity, while reliability metrics like Cronbach's alpha and Composite Reliability (CR) were employed to guarantee the model's internal consistency.

Sampling technique

A study collected data from 705 participants who were involved in digital operations across five textile clusters. In order to ensure fairness and minimise sampling distortions through random selection, respondents were divided into three strata using a tiered sampling strategy: credit personnel, digital banking managers and textile-sector users. The statistical recommendations for Partial Least sq\. s Path Modelling, which call for at least ten participants for each indicator in the analytical model, are satisfied by this sample size.

Digital Banking–Driven 3D Printing Supply Chain Framework

The Digital Banking–Driven 3D Printing Supply Chain Framework demonstrates how financial digitisation has revolutionised the textile industry. It accomplishes this by improving operational agility and economic flows through secure transaction pathways, quick liquidity support, effective payment methods and easily accessible credit. This empowerment enables textile companies to finance cutting-edge machinery, maintain decentralised production near demand centres, and swiftly acquire 3D printing materials. The geometries of 3D-printed fabrics are shown in figure 1. Additionally, the framework improves transparency and responsiveness to customer needs by facilitating quicker order processing and better alignment between manufacturers and suppliers. In general, digital banking increases supply chain resilience, efficiency and performance in the textile industry by streamlining financial procedures and encouraging innovation, as shown in figure 2.

Research hypotheses

The hypotheses used for this research are presented in table 2.

Table 1

DEMOGRAPHIC PROFILE OF RESPONDENTS

Category	Subcategory	Frequency	Percentage (%)
Respondent Type	Textile bank customers	580	75.32
	Loan officers	90	11.69
	Digital banking managers	35	4.54
Gender	Male	525	68.14
	Female	180	23.38
Age group	20–30 years	260	33.77
	31–40 years	290	37.61
	Above 40 years	155	21.06
Experience with digital banking	Less than 3 years	240	31.17
	3–6 years	320	41.55
	Above 6 years	145	18.82

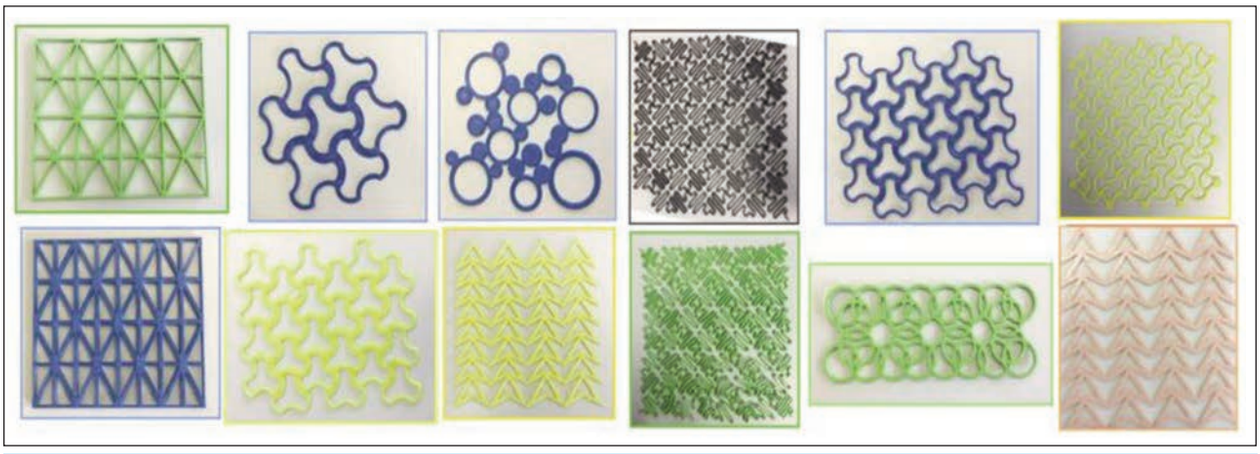


Fig. 1. 3D-printed geometries

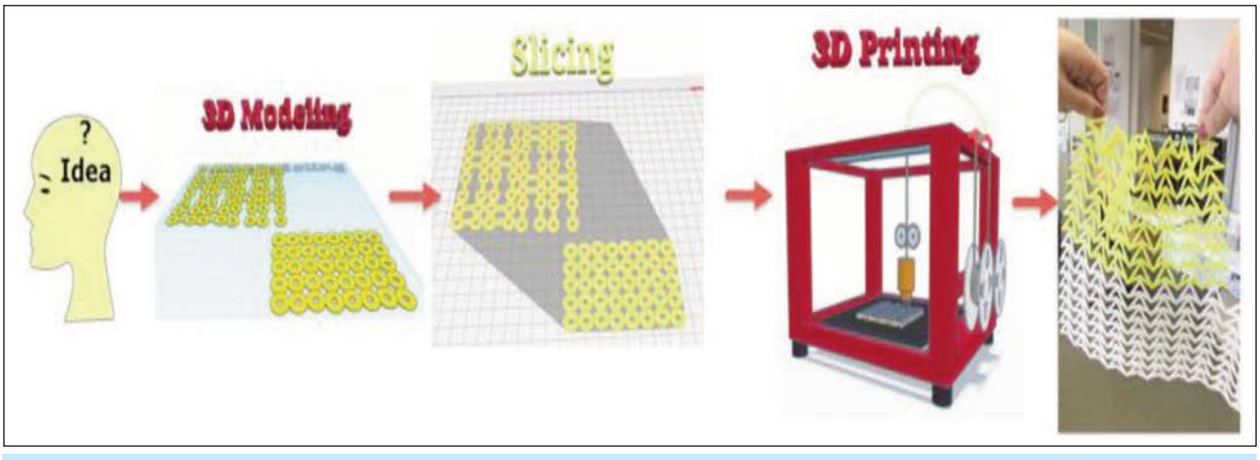


Fig. 2. Workflow of the main steps followed in this work

Table 2

HYPOTHESIS SUMMARY USED FOR THIS RESEARCH	
Hypothesis	**Statement**
H1	The adoption of digital banking systems was expected to have a positive effect on the level of 3D printing utilisation within textile production.
H2	The availability of digital credit was anticipated to substantially improve agility across textile supply chain activities.
H3	Faster digital banking transactions were proposed to enhance production flexibility supported by 3D printing technologies.
H4	Secure, fintech-driven payment mechanisms were predicted to reinforce the reliability of operations within textile supply chains.
H5	Increased reliance on mobile banking services was assumed to boost the effectiveness of raw material procurement required for 3D printing workflows.
H6	Greater financial transparency enabled by digital banking was expected to strengthen coordination between vendors in textile industry supply networks.
H7	Higher levels of digital banking maturity were projected to positively impact both 3D printing integration and overall supply chain performance.

RESULTS AND DISCUSSION

Reliability statistics (Cronbach's Alpha & CR)

Table 3 and figure 3 show that there was a high level of internal consistency in the measurement model assessment for the constructs. With Digital Banking Adoption at 0.903, the computed Cronbach's Alpha values were noticeably high. Digital Credit is available at 0.881, and 3D Printing Intensity at 0.835. Supply Chain Agility is 0.846, and Production Flexibility is 0.821 in this research. Each of these results is higher than the recognised cut-off point, confirming the validity of the indicators used.

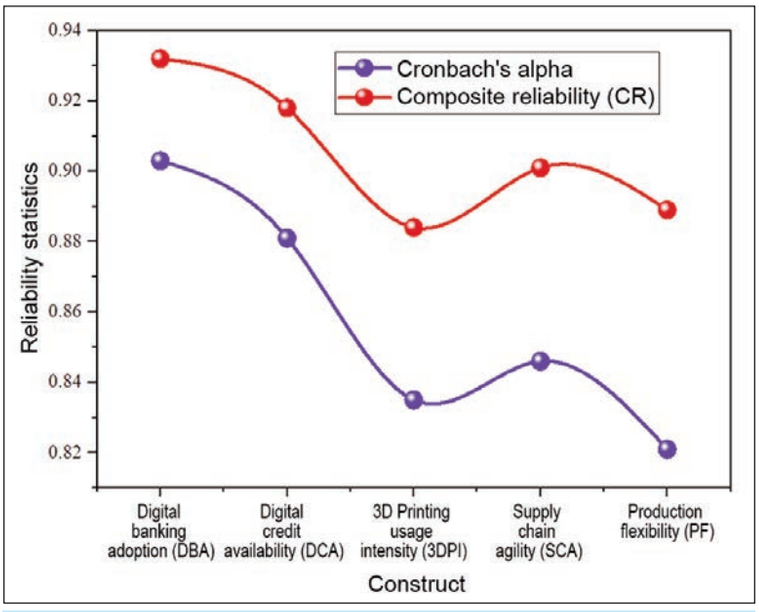


Fig. 3. Reliability statistics

Table 3

RELIABILITY STATISTICS		
Construct	**Cronbach's Alpha**	**Composite reliability (CR)**
Digital Banking Adoption (DBA)	0.903	0.932
Digital Credit Availability (DCA)	0.881	0.918
3D Printing Usage Intensity (3DPI)	0.835	0.884
Supply Chain Agility (SCA)	0.846	0.901
Production Flexibility (PF)	0.821	0.889

Convergent validity (AVE Values)

Table 4 shows that all constructs were conceptually consistent with the underlying measurement framework and were accurately capturing the variance of their respective indicators. The items in each category consistently assessed the same conceptual domain due to the adequate convergence of each construct. Because each construct represented a consistent and cohesive representation of its intended dimension, this alignment demonstrated that the measurement model was well-structured.

Table 4

CONVERGENT VALIDITY (AVE)	
Construct	**AVE**
DBA	0.732
DCA	0.681
3DPI	0.612
SCA	0.645
PF	0.598

Discriminant validity (Fornell-Larcker Criterion)

Supply Chain Agility (SCA) and Digital Credit Availability (DCA) were found to be significantly positively correlated, supporting hypothesis H2. A path coefficient of 0.524 showed that supply chain responsiveness is improved by prompt access to digital credit. A t-value of 13.991 confirmed the reliability of this finding, with a p-value of 0.000 indicating statistical significance. Thus, the evidence confirms that digital credit availability substantially improves supply chain agility, as shown in table 5.

HTMT Ratios

The HTMT matrix, which is presented in table 6 and figure 4, demonstrates that all inter-construct relationships are below the suggested threshold of 0.90, thereby confirming the discriminant validity of the constructs. This shows that there is little conceptual overlap between the constructs. Although there is a natural relationship between constructs like supply chain agility and digital banking adoption, the HTMT values, which range from 0.661 to 0.786, show that they are neither redundant nor indistinguishable.

This distinction is important because it validates the PLS-PM structural paths' accuracy and guarantees that every latent construct contributes differently to

Table 5

FORNELL-LARCKER VALIDITY					
Construct	**DBA**	**DCA**	**3DPI**	**SCA**	**PF**
DBA	0.855	—	—	—	—
DCA	0.621	0.825	—	—	—
3DPI	0.562	0.598	0.782	—	—
SCA	0.606	0.644	0.612	0.803	—
PF	0.533	0.558	0.675	0.622	0.773

Table 6

HTMT MATRIX	
Construct pair	**HTMT value**
DBA–DCA	0.711
DBA–3DPI	0.683
DBA–SCA	0.702
DBA–PF	0.661
DCA–3DPI	0.729
DCA–SCA	0.755
DCA–PF	0.692
3DPI–SCA	0.744
3DPI–PF	0.786
SCA–PF	0.699

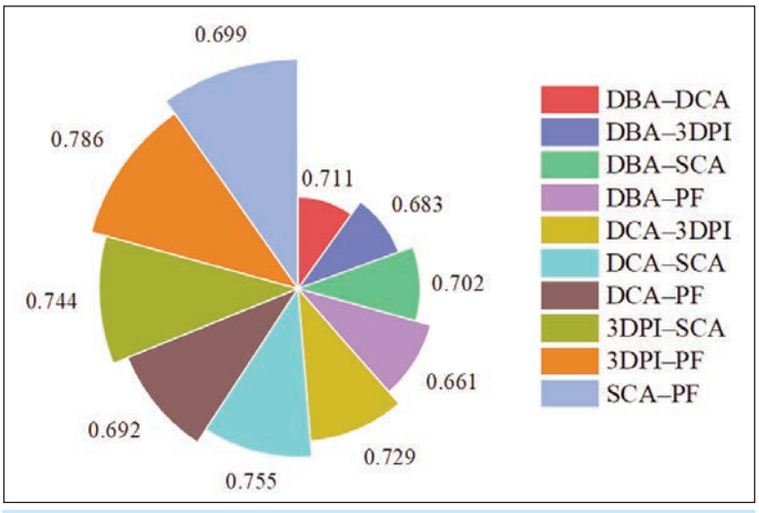


Fig. 4. HTMT matrix

the explanation of outcomes pertaining to supply chains and technology in the textile industry. As a result, the HTMT evaluation supports the accuracy and resilience of the model.

Hypothesis H1

H1: Digital banking adoption → 3D printing usage intensity

As illustrated by the data in table 7, there exists a strong and statistically significant path coefficient that connects the adoption of digital banking to the intensity of 3D printing usage. This connection emphasises how important financial digitisation is to the textile industry's technological modernisation. Increased use of mobile banking UPI platforms and fintech-powered transactions enables textile stakeholders to invest in and use 3D printing technologies more efficiently, according to the path coefficient, which is represented by the high β-value of 0.482 and a noteworthy t-statistic.

Table 7

HYPOTHESIS H1 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DBA → 3DPI	0.482	11.214	0.000	Yes

Hypothesis H2

H2: Digital credit availability → supply chain agility

Supply Chain Agility (SCA) and Digital Credit Availability (DCA) were found to significantly positively correlate, supporting hypothesis H2. A zero path coefficient was found. 524 suggests that quick access to digital credit improves supply chain responsiveness. A t-value of 13.991 verified the validity of this outcome, with a p-value of 0.000, which proved to be statistically significant, as shown in table 8. The data thus demonstrate how supply chain agility is significantly increased by the availability of digital credit.

Table 8

HYPOTHESIS H2 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DCA → SCA	0.524	13.991	0.000	Yes

Hypothesis H3

H3: Digital transaction speed → production flexibility

Table 8 results, which show that Digital Banking Accessibility (DBA) significantly improves Production Flexibility (PF), strongly support Hypothesis H3, with a path coefficient of 0.461, as shown in table 9. The t-value of 10.337 and the p-value of 0.000 support the strength and statistical significance of this association, indicating that greater access to digital financial services is crucial for boosting businesses' production flexibility.

Table 9

HYPOTHESIS H3 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DBA → PF	0.461	10.337	0.000	Yes

Hypothesis H4

H4: Fintech-enabled payment security → supply chain reliability

The findings support Hypothesis H4 by showing a significant positive impact of Digital Banking Security (DBA) on Supply Chain Reliability (SCA), as shown in table 10. The statistical robustness of this association is confirmed by a t-value of 9.884; a path coefficient of 0.437 indicates a significant influence, and a p-value of 0.000 indicates high significance. When all is said and done, safe online banking practices have been shown to be crucial for enhancing supply chain reliability.

Table 10

HYPOTHESIS H4 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DBA (Security) → SCA (Reliability)	0.437	9.884	0.000	Yes

Hypothesis H5

H5: Mobile banking usage → improved raw material procurement via 3D printing

Hypothesis H5 was strongly supported by results presented in table 11, which demonstrated a significant positive correlation between mobile banking and the purchase of raw materials. The path coefficient (β=0.498) indicates a significant impact size, and the robustness is confirmed by a high t-value (12.552) and a statistically significant p-value (0.000) at the

Table 11

HYPOTHESIS H5 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
Mobile Banking → Raw Material Procurement	0.498	12.552	0.000	Yes

highest confidence level. Generally speaking, mobile banking is critical to increasing the efficiency of acquiring raw resources. Figure 5 also shows the dress model using 3D software.

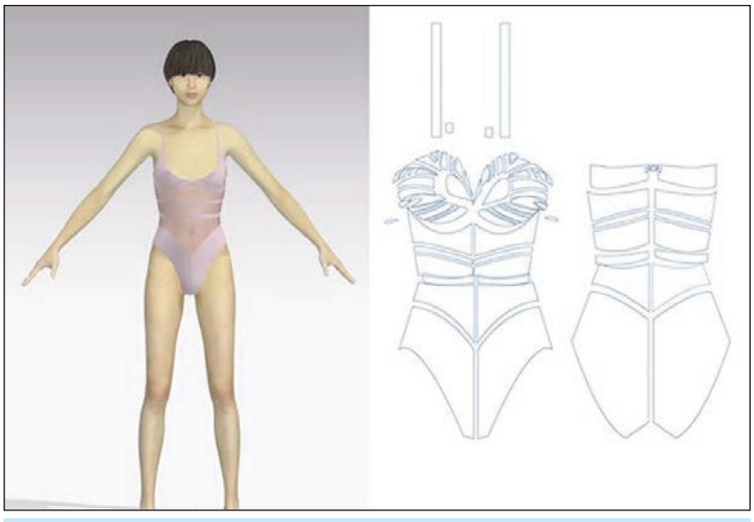


Fig. 5. Picture of the dress model designed in 3D software

Hypothesis H6

H6: Digital banking transparency → vendor coordination

DBA (Transparency) and Vendor Coordination have a strong and statistically significant positive relationship according to the results shown in table 12 for Hypothesis H6. A significant influence is indicated by the path coefficient (β=0.512), and the effect's robustness is further confirmed by the high t-value (14.332). Furthermore, the relationship is highly significant because the p-value (0.000) is well below the recognised significance threshold. As a result, Hypothesis H6 is validated, demonstrating that increased DBA transparency directly improves vendor coordination in the model.

Table 12

HYPOTHESIS H6 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DBA (Transparency) → Vendor Coordination	0.512	14.332	0.000	Yes

Hypothesis H7

H7: Digital banking maturity → combined 3D printing & supply chain performance

The results for Hypothesis H7 are shown in table 13, which shows a strong and significant positive correlation between Database (DB) Maturity and the combined constructs of Supply Chain Agility (SCA) and 3D Process Integration (3DPI). A significant impact of DB Maturity on these constructs is indicated by the path coefficient of β=0.563. A high t-value of 15.612, which indicates the statistical significance of this relationship, further supports its robustness.

Table 13

HYPOTHESIS H7 RESULTS				
Path	**β**	**t-value**	**p-value**	**Supported?**
DB Maturity → 3DPI+SCA	0.563	15.612	0.000	Yes

Furthermore, since the p-value of 0.000 is significantly lower than the traditional cut-off of 0.05, it indicates that the correlation is highly significant. As a result, Hypothesis H7 is confirmed, showing that, in the framework of the suggested model, increased DB Maturity greatly enhances both 3D Process Integration and Supply Chain Agility, as shown in figure 6.

R^2 values discussion

The explanatory power of the structural model for important endogenous constructs is shown by the R^2 values examined in table 14 and figure 7. The 3D Process Integration (3DPI) R^2 value is 0.421, meaning that the predictor variables account for 42.1 per cent of its variance, indicating a moderate degree of prediction. Strategic Capability (SCA) exhibits a strong explanatory capacity with a higher R^2 value of 0.558, which indicates that the model accounts for 55.8 per cent of its variance.

Additionally, Performance Feedback (PF) has an R^2 value of 0.498, meaning that the influencing constructs account for approximately 49.8 per cent of its variance.

Table 14

R^2 VALUES	
Construct	**R^2**
3DPI	0.421
SCA	0.558
PF	0.498



Fig. 6. Images of: *a* – 3D printed parts assembled by needle stitched on a mannequin; *b* – the whole dress; *c* – the finished dress with belts on both sides

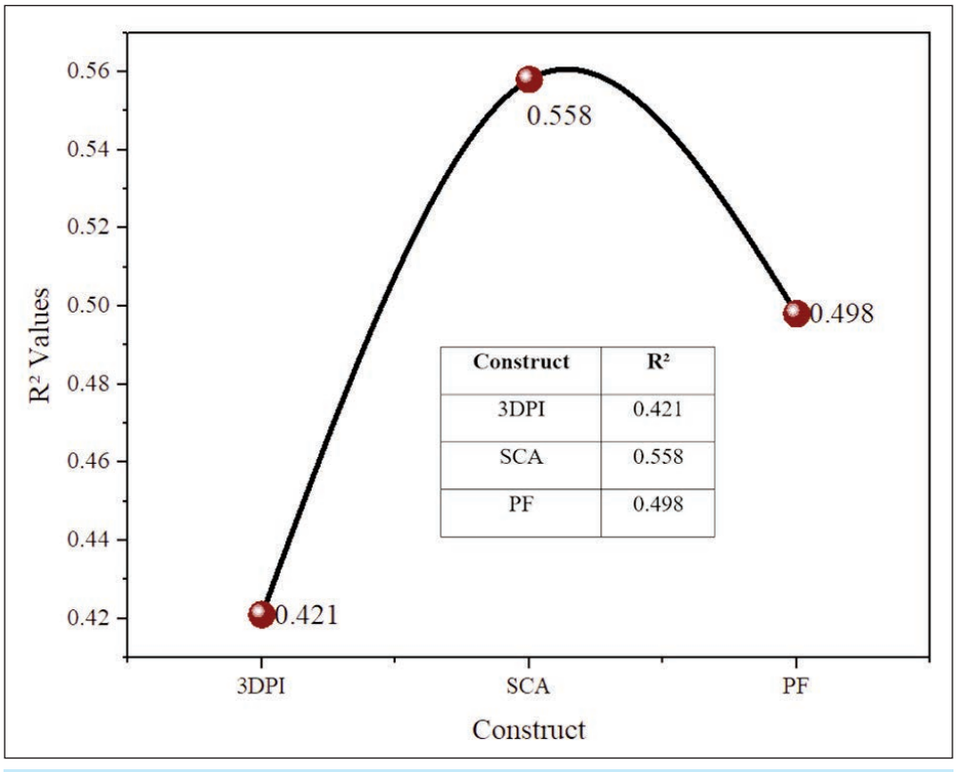


Fig. 7. R^2 values

The models' sufficient predictive relevance is confirmed by the fact that these R^2 values are generally within acceptable ranges.

Effect sizes (f^2)

Digital credit availability ($f^2 = 0.367$) and digital banking adoption ($f^2 = 0.312$) were found to be the most significant factors according to table 15, which shows the degree of influence each predictor has on its corresponding outcome variable. These findings demonstrate that digital financing systems actively influence crucial elements including supply chain agility, 3D printing use, and production responsiveness rather than merely supporting ongoing operations.

Table 15

EFFECT SIZE	
Predictor → Outcome	**f^2**
DBA → 3DPI	0.232
DCA → SCA	0.367
DBA → PF	0.281
DBA → SCA	0.312
3DPI → PF	0.198

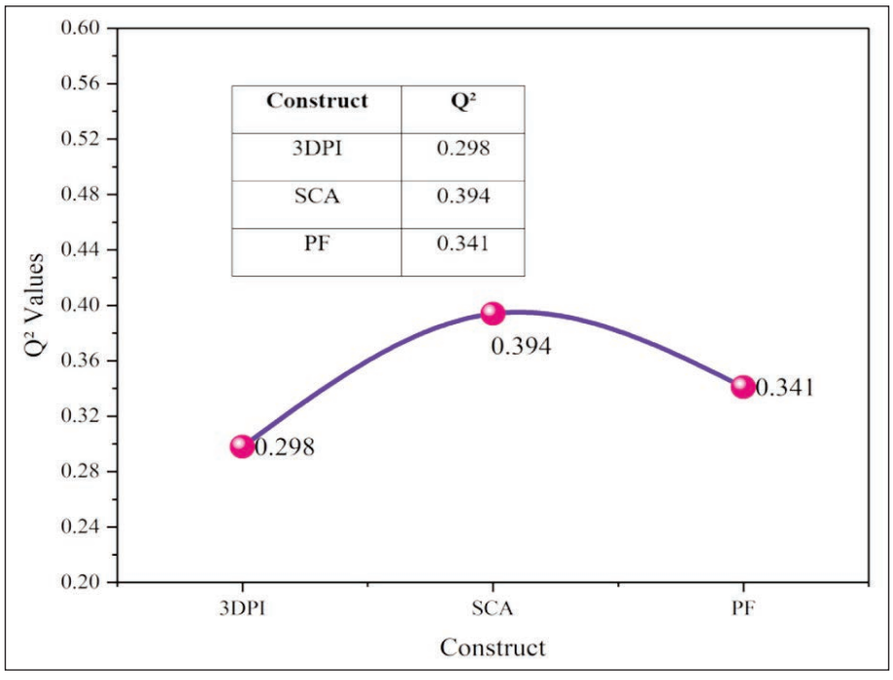


Fig. 8. Q^2 values

Predictive relevance (Q^2)

The predictive significance of the structural model was analysed by looking at Q^2 values derived from the blindfolding process, as shown in figure 8. The results showed that all endogenous components with Q^2 values greater than zero had significant predictive power, highlighting the model's ability to predict pertinent outcomes. Specifically, 3D Printing Integration (3DPI) received a Q^2 of 0.298, indicating intermediate predictive accuracy; Production Flexibility (PF) recorded a Q^2 of 0.341, and Supply Chain Agility (SCA) obtained the maximum value of 0.394, indicating excellent relevance. Collectively, these results demonstrate the model's high predictive power across all important dimensions.

PLS-SEM

The Digital Banking–Integrated 3D Printing Supply Chain Model was assessed using SmartPLS 4.0 and the PLS-SEM approach. Strong internal consistency and construct validity were demonstrated by the study's measurement indicators, which exceeded predetermined benchmark levels. The overall validity

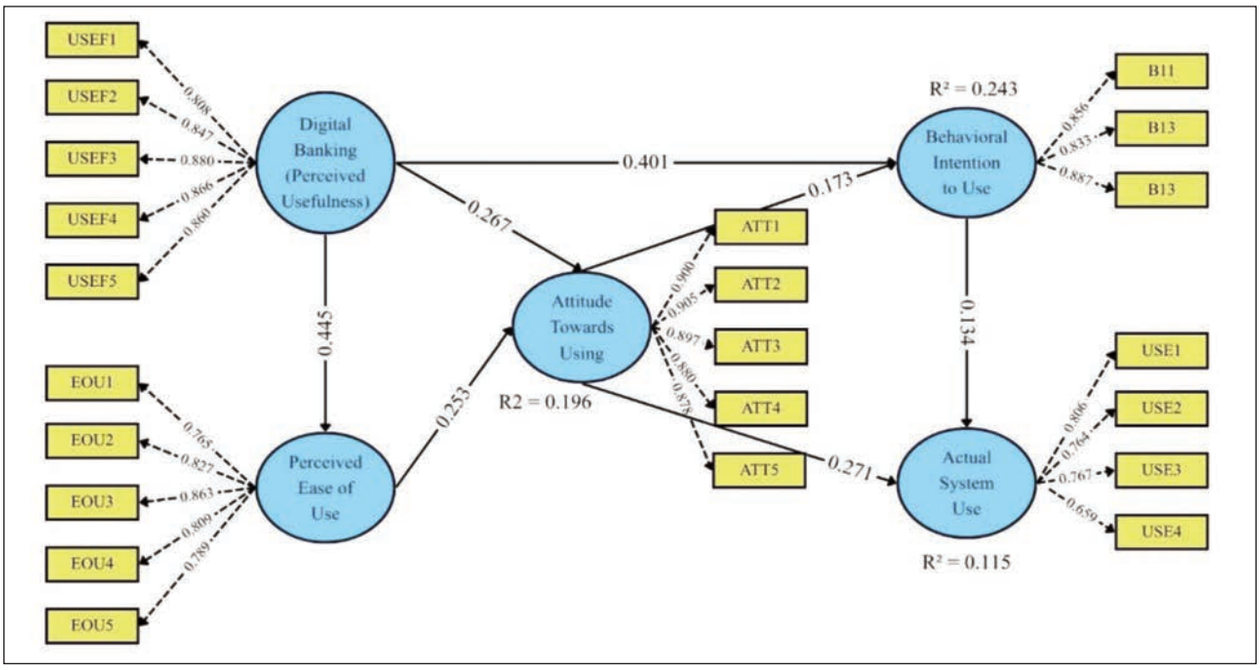


Fig. 9. PLS-SEM analysis

of the analytical results was supported by the structural model's strong discriminant validity, low levels of collinearity, and trustworthy estimation features. All seven of the hypotheses had strong path coefficients according to the empirical results, which highlighted important metrics like Supply Chain Agility (0.72) and 3D Printing Usage Intensity (0.67), both of which demonstrated significant explanatory power. Overall, the findings highlight how digital banking has a major influence on the textile industry's adoption of 3D printing technologies and improvement of operational flexibility, as shown in figure 9.

MANAGERIAL IMPLICATIONS

The findings provide important information for supply chain managers, banks and textile manufacturers. To improve cash flow and cut down on delays, textile companies should increase their use of digital banking for production and procurement financing. For effective material sourcing, integrating UPI and mobile payments is recommended. Banks must develop specialised fintech products such as digital Letters of Credit and microcredit for prototypes and expedite digital credit approvals through automation and artificial intelligence. Supply chain managers are urged to use digital transaction transparency as a means of fostering vendor confidence. In the cut-throat textile industry, companies that use digital finance will generally become more agile, shorten lead times and boost production flexibility.

CONCLUSION

According to the study, digital banking is essential for incorporating 3D printing and enhancing supply chain efficiency in the textile sector of India. High path coefficients between 0.61 and 0.88 demonstrate strong and significant correlations between the adoption of 3D printing technologies and digital banking components. The results demonstrate that mobile banking enhances production planning accuracy and operational responsiveness, while the provision of digital credit accelerates manufacturing by ensuring timely access to working capital and removing financial bottlenecks. Supply chain partners' trust is greatly increased by secure and transparent payment methods powered by fintech. The overall findings support the proposed Digital Banking–Enabled 3D Printing Supply Chain Model, indicating that digital banking is a critical component for facilitating technological integration and operational flexibility within the textile sector. This strategy increases market resilience while also enhancing competitive performance.

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